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(54) Chair tilting mechanism and a chair incorporating such a mechanism

(57) A chair tilt mechanism comprising a mechanism support adapted for connection to the seat of a chair and including first means for connection to a chair base and which are pivoted to said mechanism support, second means for connection to a chair back support pivoted to said first means and resilient biasing means which extend between the pivot between the first and second means and the mechanism support, movement of the mechanism support against the biasing causing relative angular movement between the first and second means and relative angular movement of the mechanism support about the pivot between the first means and the mechanism support.

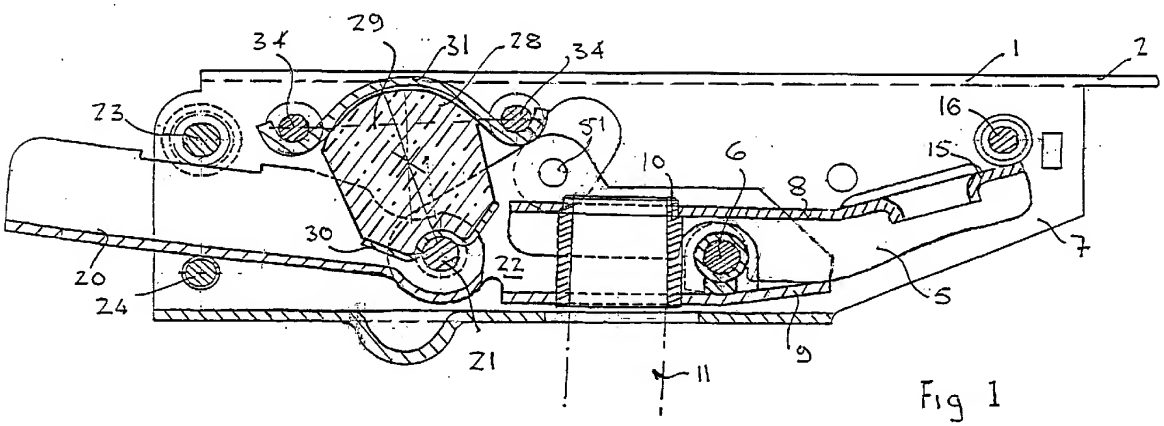

Fig 1

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Description

[0001] This invention relates to a chair tilting mechanism and to a chair incorporating such a mechanism. Chairs of this type provide for tilting of the seat of the chair and for tilting of the back and are frequently employed in office chairs.

[0002] UK Patent GB 2 264 862 shows such a mechanism which employs a fixed support, a seat support pivotally connected to the fixed support by a pivot, a back rest support and a bias means connected between at least two of the supports to provide bias during tilting. In this construction the back rest support is pivotally connected to the fixed support of the pivot and to a seat support by a connector which allows both rotation and translational movement, the connector being located rearwardly of the pivot between the back rest and the fixed supports. The pivot between the seat and the fixed supports is located forwardly of the pivot between the back rest and the fixed supports and the bias means act between the seat and fixed supports forwardly of the pivot between the seat and the fixed supports.

[0003] In this construction the bias means are in the form of a compression spring mounted at the front of the seat and locking means are provided.

[0004] The present invention is intended to provide a chair tilt mechanism which is easier to construct and is less expensive to manufacture. It is also intended to provide a neater construction which is visually more attractive.

[0005] According to the present invention a chair tilt mechanism comprises a mechanism support adapted for connection to the seat of a chair and including first means for connection to a chair base and which are pivoted to said mechanism support, second means for connection to a chair back support pivoted to said first means and resilient biasing means which extend between the pivot between the first and second means and the mechanism support, movement of the mechanism support against the biasing causing relative angular movement between the first and second means and relative angular movement of the mechanism support about the pivot between the first means and the mechanism support.

[0006] Thus, when a weight is applied to the biasing means caused by a person using the seat of the chair this weight acts against the biasing means and tends to cause the first and second means to rotate angularly in relation to each other. Moreover, there is also angular movement about the pivot between the first means and the mechanism support thus allowing the mechanism support to alter its relative angle to the chair base and at the same time to allow the chair back support to also alter its relative angle in relation to the tilted chair seat.

[0007] Preferably the first and second means are provided respectively by the arms of a toggle joint, said resilient biasing means acting on the joint pivot.

[0008] The resilient biasing means can be provided by a block or blocks of resilient material, for example rubber or a synthetic polymeric material. Thus, the heavy biasing spring of the earlier construction referred to above is not required.

[0009] The block or blocks of resilient material are preferably deformed from an initial shape during installation so that they are pre-stressed when in position ready for use.

[0010] If desired means for locking the mechanism support to the first means can be provided.

[0011] The invention also includes a chair incorporating the tilt mechanism set forth above.

[0012] The invention can be performed in various ways but one embodiment will now be described by way of example and with reference to the accompanying drawings in which :

Figure 1 is a cross-sectional side elevation of a chair tilt mechanism according to the invention taken on line I-I of Figure 2;

Figure 2 is a plan view from above of the mechanism shown in Figure 1;

Figure 3 is a isometric view of a retainer which is used with the biasing mechanism;

Figure 4 is an isometric view of a block of resilient material which provides part of the biasing mechanism and which is used in conjunction with the retainer shown in Figure 3;

Figure 5 is a part cross-sectional side elevation of locking means;

Figure 6 is a side elevation of an office chair incorporating the invention;

Figure 7 is a side elevation of an alternative construction;

Figure 8 is a plan view from above of the construction shown in Figure 7;

Figure 9 is a cross-sectional side elevation on the line IX-IX of Figure 10 of part of the construction shown in Figures 7 and 8; and,

Figure 10 is a plan view from above of the construction shown in Figure 9.

[0013] In the construction shown in Figures 1 to 6 the chair tilt mechanism according to the present invention comprises a channel shaped mechanism support 1, the upper edges of the channel being provided with flanges 2 for attachment to the lower part of the seat 3 of a chair with which it is to be used. Openings 4 are provided in the flanges to allow them to be secured to the seat 3.

Located in the mechanism support 1 are first means in the form of a fabricated arm 5 which is carried on a pivot pin 6 which extends between the spaced apart sides 7 of the channel shaped mechanism support 1. This arm 5 is fabricated from an upper channel shaped member 8 which is located within a lower channel shaped member 9 to which it is secured by welding or the like. Extending between the two members 8 and 9 is a tube 10 which is dimensioned to accept the column 11 of a chair base 12 which is provided with castors 13. The upper channel shaped member 8 has an extension 15 which can engage a pin 16 which also extends between the sides 7 of the mechanism support 1 and which acts as a stop against downward angular movement of the mechanism support about the pivot 6.

[0014] Second means for connection to a chair back support, as shown in Figure 6, are provided by a channel shaped arm 20 which is pivoted to the lower member 9 by a pivot pin 21. The arm 20 is dimensioned to fit within the walls 22 of the lower member 9 and the pivot pin 21 extends between these walls and through suitable openings in the arm 20.

[0015] The mechanism support 1 carries upper and lower guides provided by pins 23, 24 which extend between the walls 7 and which are spaced apart to allow the arm 20 to move longitudinally and rotationally between them.

[0016] The chair back support 25 is connected to the arm 20, for example by suitable nuts and bolts.

[0017] Resilient biasing means, indicated by reference numeral 28, are provided which extend between the pivot 21 between the first and second means and the mechanism support 1. These biasing means are provided by a block 29 of resilient material, for example rubber or a synthetic polymeric material. The lower end of the block is shaped to engage a W-shaped stiffener 30 which rests against the pivot pin 21 and the upper end of the block 29 is held in place by a retainer 31, the shape of which is most clearly shown in Figure 3. The retainer comprises a pair of side channels 32 and a domed central portion 33. The domed central portion acts on the block 29 and the retainer 31 is held in place in the mechanism support 1 by a pair of spaced apart pins 34 which act against the channels 32 and restrain the retainer from upward movement, at the same time acting to compress the block 29.

[0018] The shape of the block 29 prior to location in the mechanism support is shown in Figure 4. It has been found that a block of this shape deforms approximately to the shape shown in Figure 1 when it is placed in position in the mechanism support 1 under compression.

[0019] The resilient biasing means provided by the block 29 extend between the pivot pin 21 between the first and second means and the mechanism support 1 through the pins 34. Movement of the mechanism support against the biasing causes relative angular movement between the first and second means provided by the arms 5 and 20 and relative angular movement about the pivot 6 between the first means, in the form of the arm 5, and the mechanism support 1.

[0020] The first means in the form of the arm 5 and the second means in the form of the arm 20 provide respectively the arms of a toggle joint and the resilient biasing means 28 act on the joint pivot 21.

[0021] When the chair is used the weight of the occupier acts against the biasing means and the relative angular movement between the arms of the toggle joint thus act to alter their relative angles in relation to the tube 10 and thus the angle of the seat 3 in relation to the angle of the arm 20 and to the back 25. Simultaneously there is a pivoting movement of the arm 20 about the pivot pin 21 until the components reach a position which is suitable to the user, the relative movements of the seat and the chair back are indicated by the arrows in Figure 6.

[0022] Tilting of the seat against the resilient biasing means can be achieved by the user as required.

[0023] Figure 5 shows means for locking the mechanism in a desired position and comprises a bracket 38 carried by a pair of pins 39 which extend between the side walls 7 of the mechanism support 1, the bracket is thus rigidly held in position. Extending from the bracket is a screw threaded column 40 which passes through an opening 41 in the extension 15 to a screw threaded adjustment knob 42. Axial adjustment of the knob 42 on the column 40 fixes the position of the extension 15 and thus the first arm 5 thus locking the mechanism in position.

[0024] In order to allow free movement of the mechanism the knob 42 is moved to an axially displaced position which allows the free movement.

[0025] Means can be included for adjusting the height of the chair stem and these means can be of well-known type, for example Figure 2 shows a cranked adjustment spindle 50 which passes through an opening 51 which passes through the upper part of the lower member 9 and locates in an opening 52 on the other side. Rotation of the adjusting rod 50 causes the stem 11 to rise and fall in the tube 10. Such adjustment mechanisms are well-known and it will not therefore be described further.

[0026] In the construction described above a solid block of resilient material is used as the biasing means but, if required, two or more blocks of material could be employed.

[0027] If desired the resilient block or blocks could be replaced by some other form of biasing, for example a compression spring, but the use of a resilient block provides a simple and reliable construction.

[0028] Figures 7, 8, 9 and 10 show an alternative construction in which similar reference numerals to those used in Figures 1 to 6 are employed to indicate similar parts. In this construction however the fabricated arm 5 is replaced by a fabricated arm 55 which has a lower channel member 9 similar to that of the previous construction but with an upper channel member 56 which extends transversely across the lower channel member

9. This channel member 56 is secured to the lower channel member 9 by welding indicated by reference numeral 57. The tube 10 extends between the members 56 and 9 in a similar manner to the tube shown in the previous construction.

[0029] In this construction the front bracing pin 16 between the sides 7 is a tube which is riveted over at its ends and the riveted pin 34 as shown in the earlier construction is replaced by a stepped pin 58 which retains one end of the spring plate 31. This allows for easier assembly.

[0030] It will be seen that the W-shaped stiffener 30 is not employed in this construction and the resilient biasing means 28 provided by the block 29 of resilient material has its lower angled faces 59 elongated, or moved further out from the main body portion, to allow the material (when loading) to bear on the channel shaped arm 20 indicated by reference numeral 60 in Figure 7. This spreads the load and prevents any tendency for the rubber block which forms the resilient means 28 splitting at its apex on the pivot pin 21 after an extended period of wear.

[0031] The removal of the extension 15 on the upper channel shaped member 8 of the previous construction removes the locking feature shown in Figure 5 which may be unnecessary in certain applications.

[0032] It will be seen that the lower part of the channel member now has a floor 61 which extends throughout its whole length and vertically upwards where indicated by reference numeral 62 which encloses the operating mechanism.

[0033] The construction shown in Figures 7, 8, 9 and 10 operates in a similar manner to that described with regard to Figures 1 to 6 apart from the locking device which is omitted.

Claims

1. A chair tilt mechanism comprising a mechanism support adapted for connection to the seat of a chair and including first means for connection to a chair base and which are pivoted to said mechanism support, second means for connection to a chair back support pivoted to said first means and resilient biasing means which extend between the pivot between the first and second means and the mechanism support, movement of the mechanism support against the biasing causing relative angular movement between the first and second means and relative angular movement of the mechanism support about the pivot between the first means and the mechanism support.

2. A chair tilt mechanism as claimed in claim 1 in which said first and second means are provided respectively by the arms of a toggle joint, said resilient biasing means acting on the joint pivot.

3. A chair tilt mechanism as claimed in claim 1 or claim 2 in which said resilient biasing means are provided by a block or blocks of resilient material.

4. A chair tilt mechanism as claimed in claim 3 in which the resilient material is rubber or a synthetic polymeric material.

5. A chair tilt mechanism as claimed in claim 3 or claim 4 in which the block or blocks are deformed from an initial shape during installation so that they are prestressed when in position ready for use.

6. A chair tilt mechanism as claimed in any one of the preceding claims including means for locking the mechanism support to the first means.

7. A chair incorporating a tilt mechanism as set forth in any one of the preceding claims.

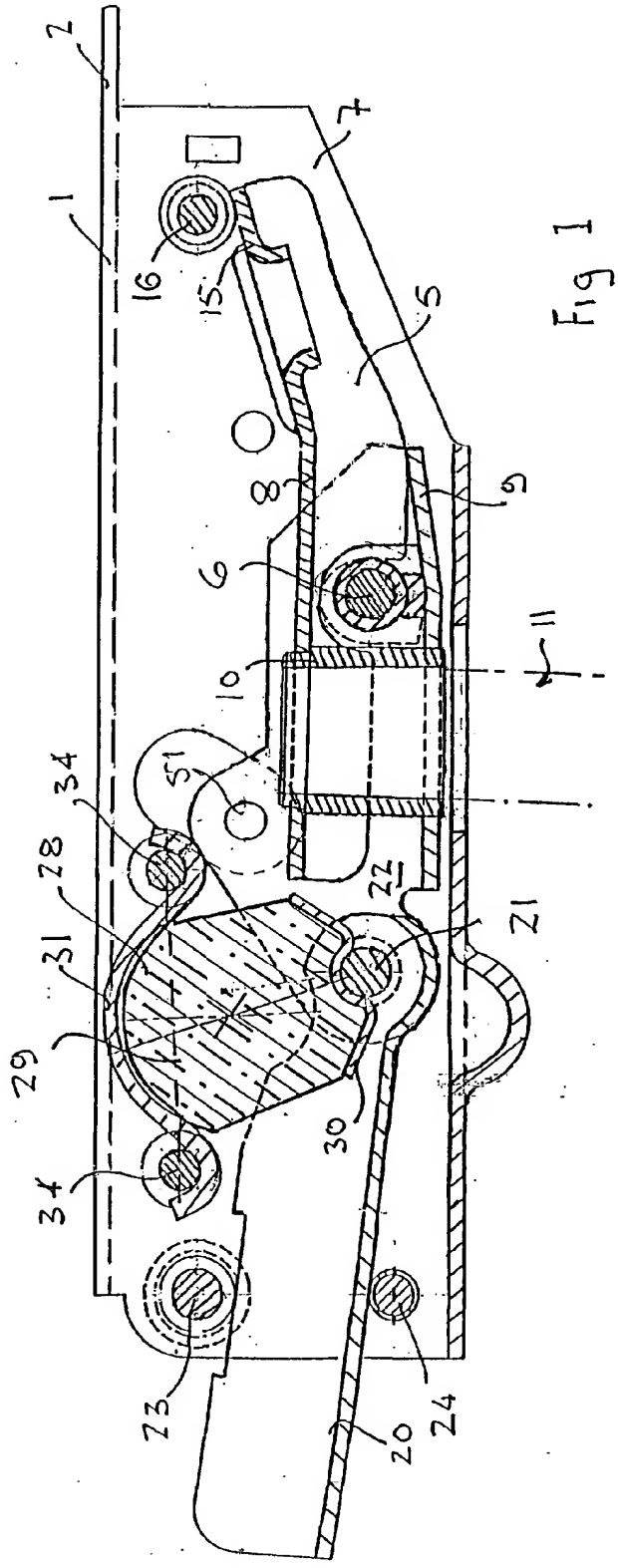

Fig 1

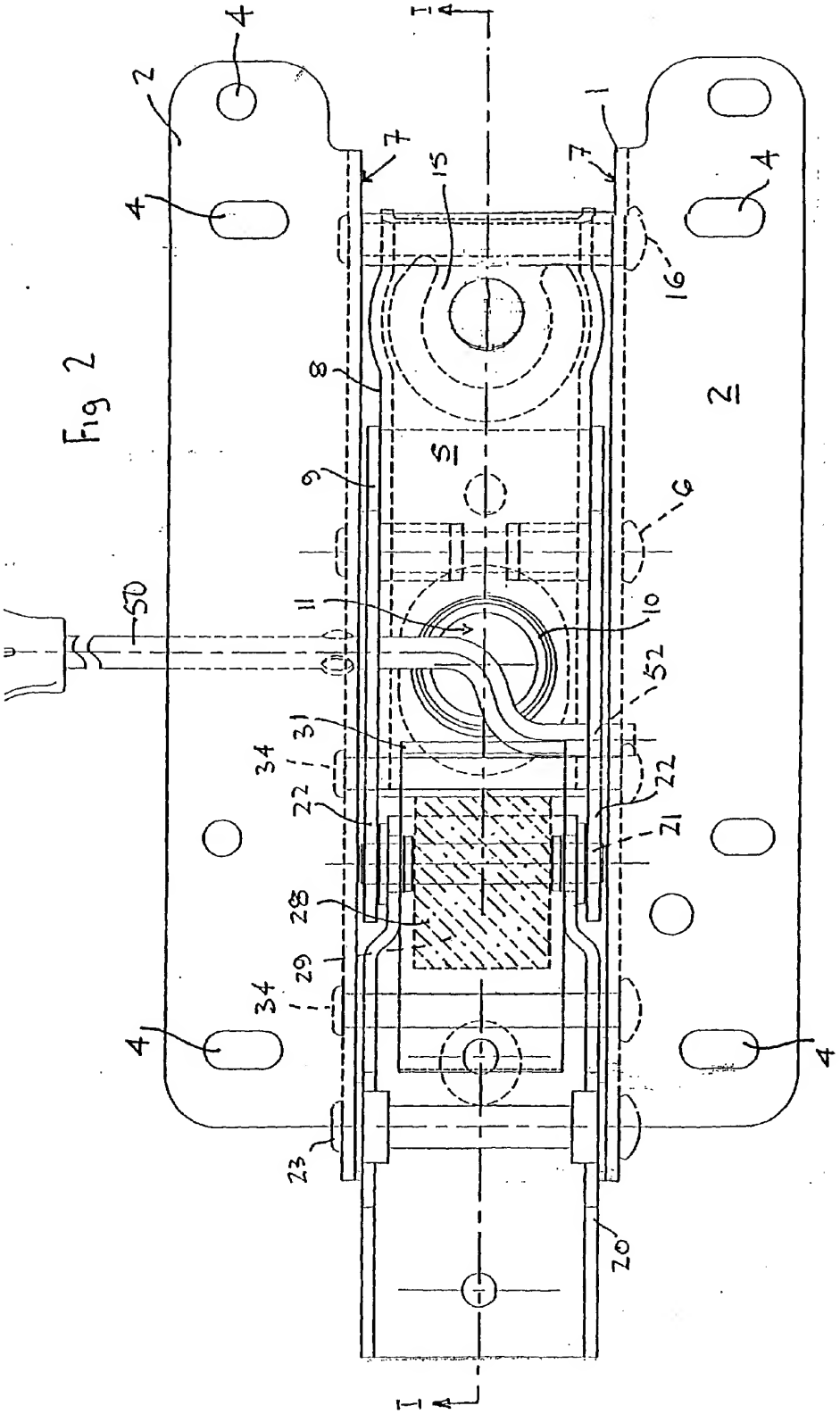
Fig 2
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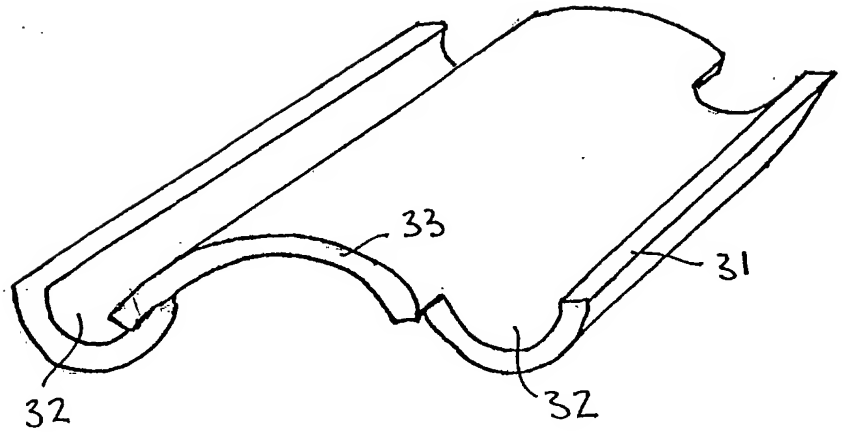
Fig 3



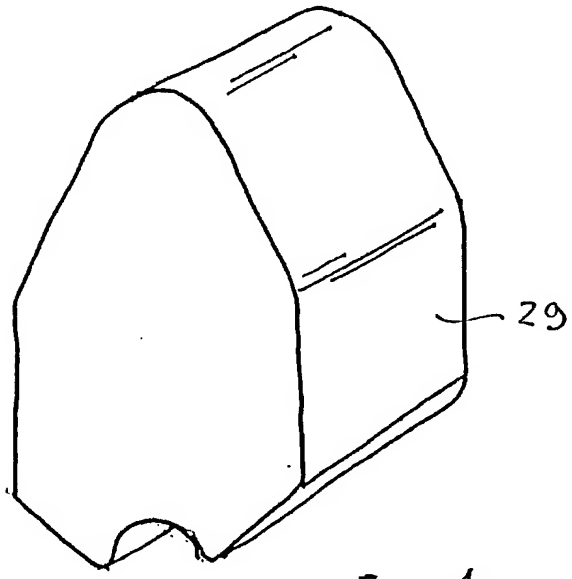


Fig 4

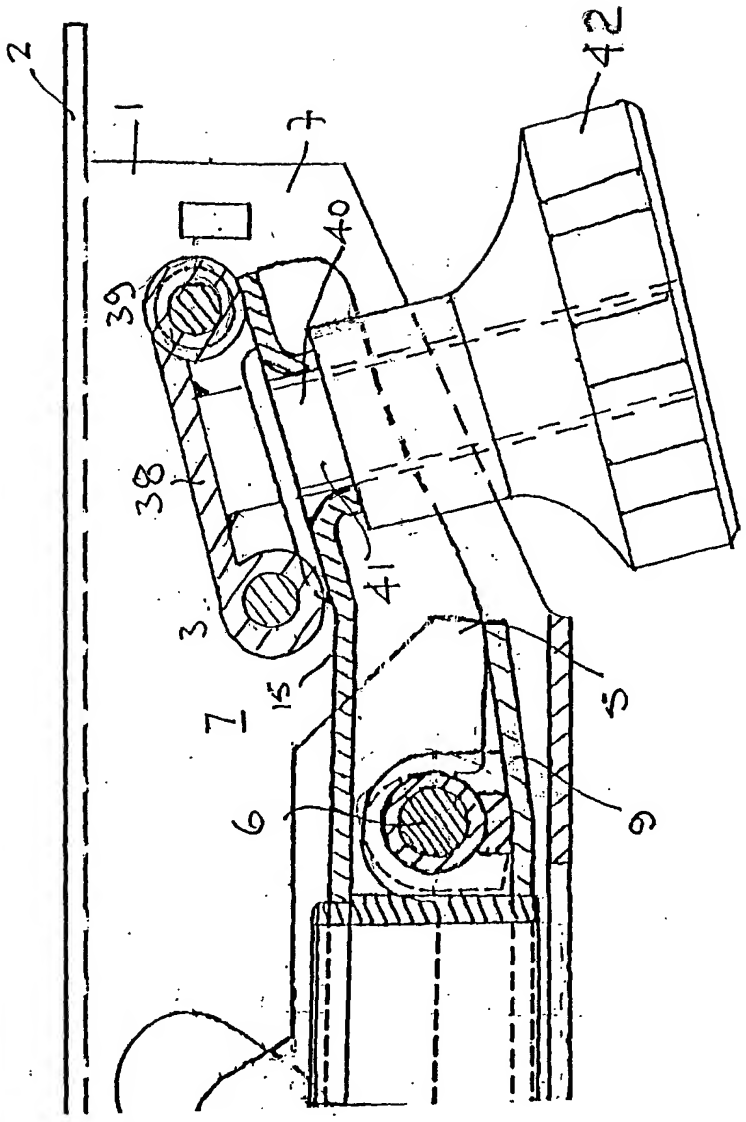


Fig 5

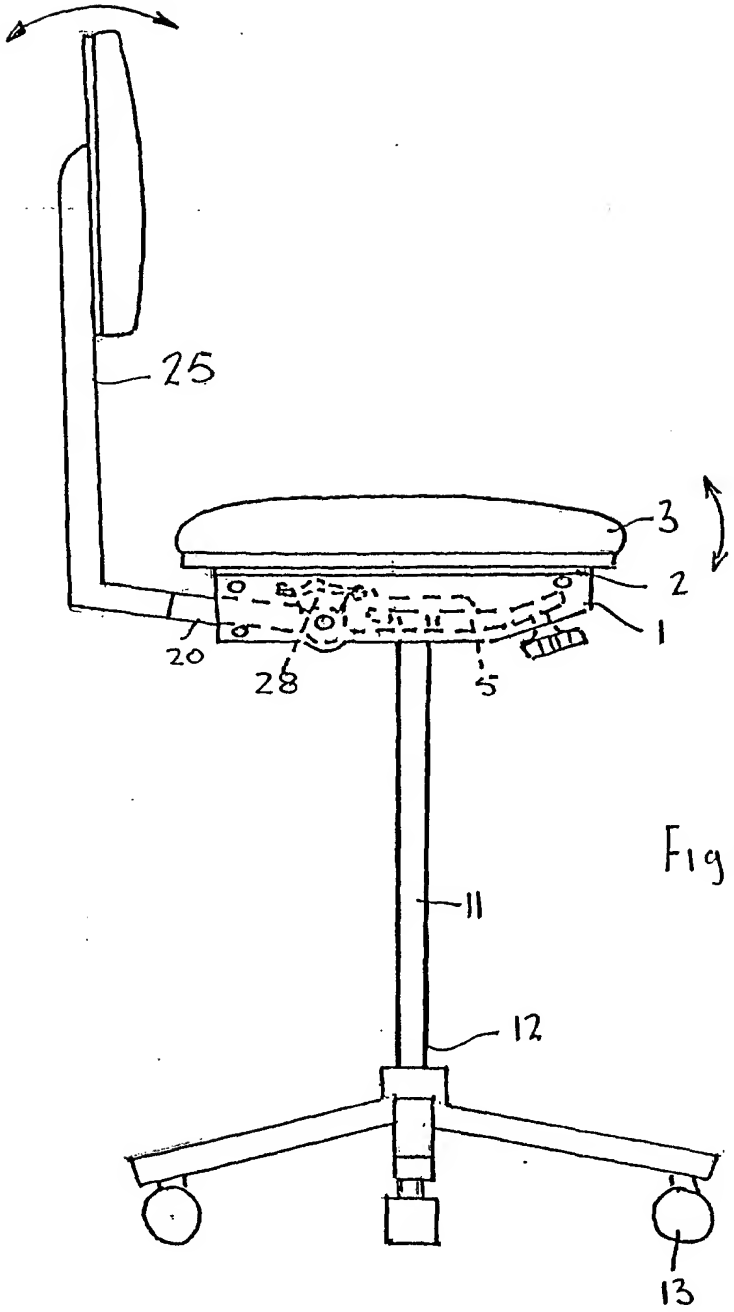


Fig 6

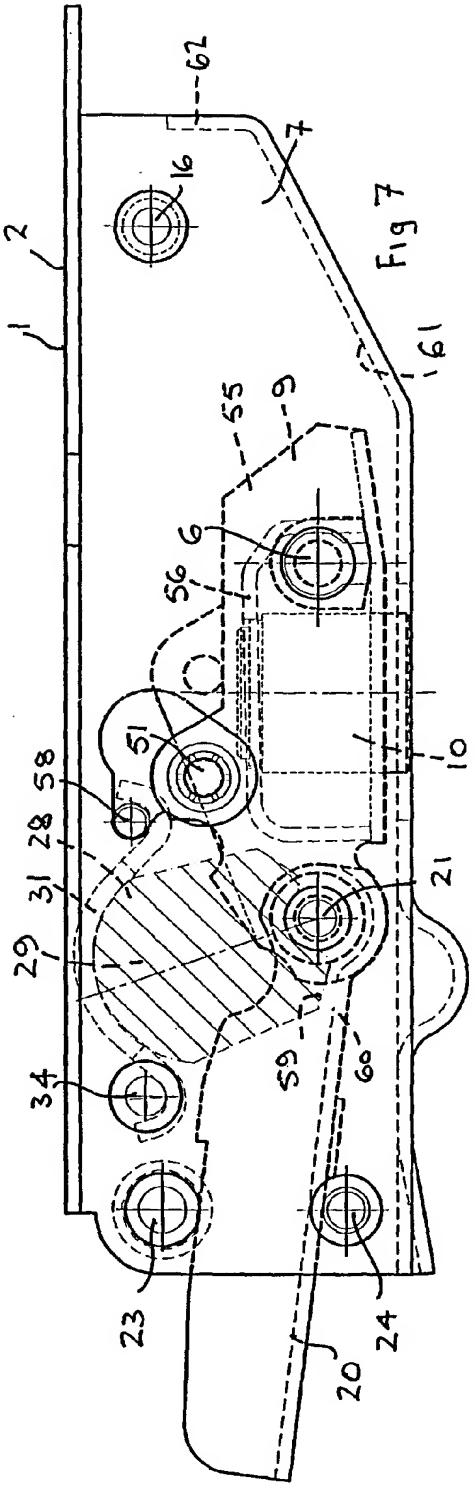


Fig 7

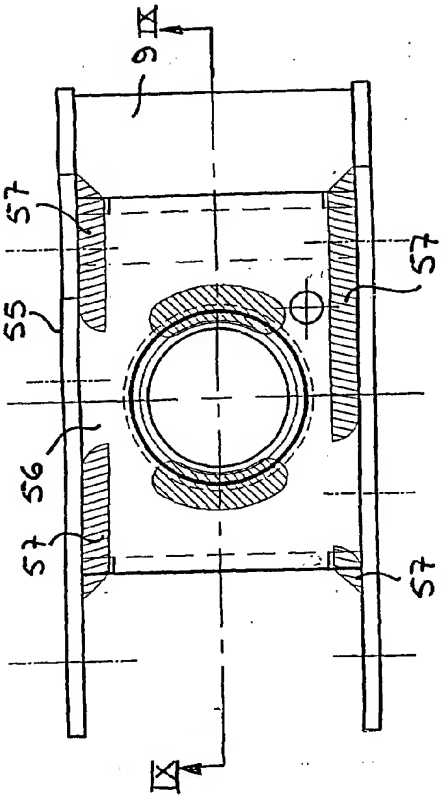


Fig 10

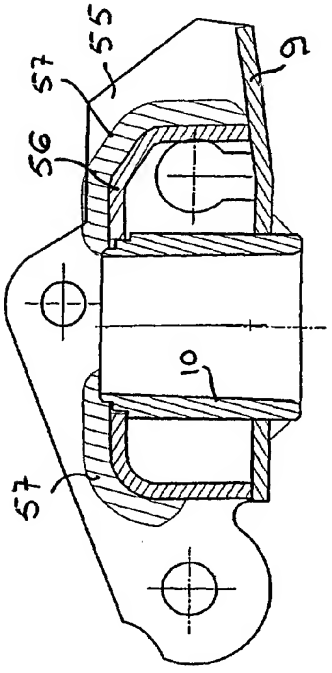


Fig 9

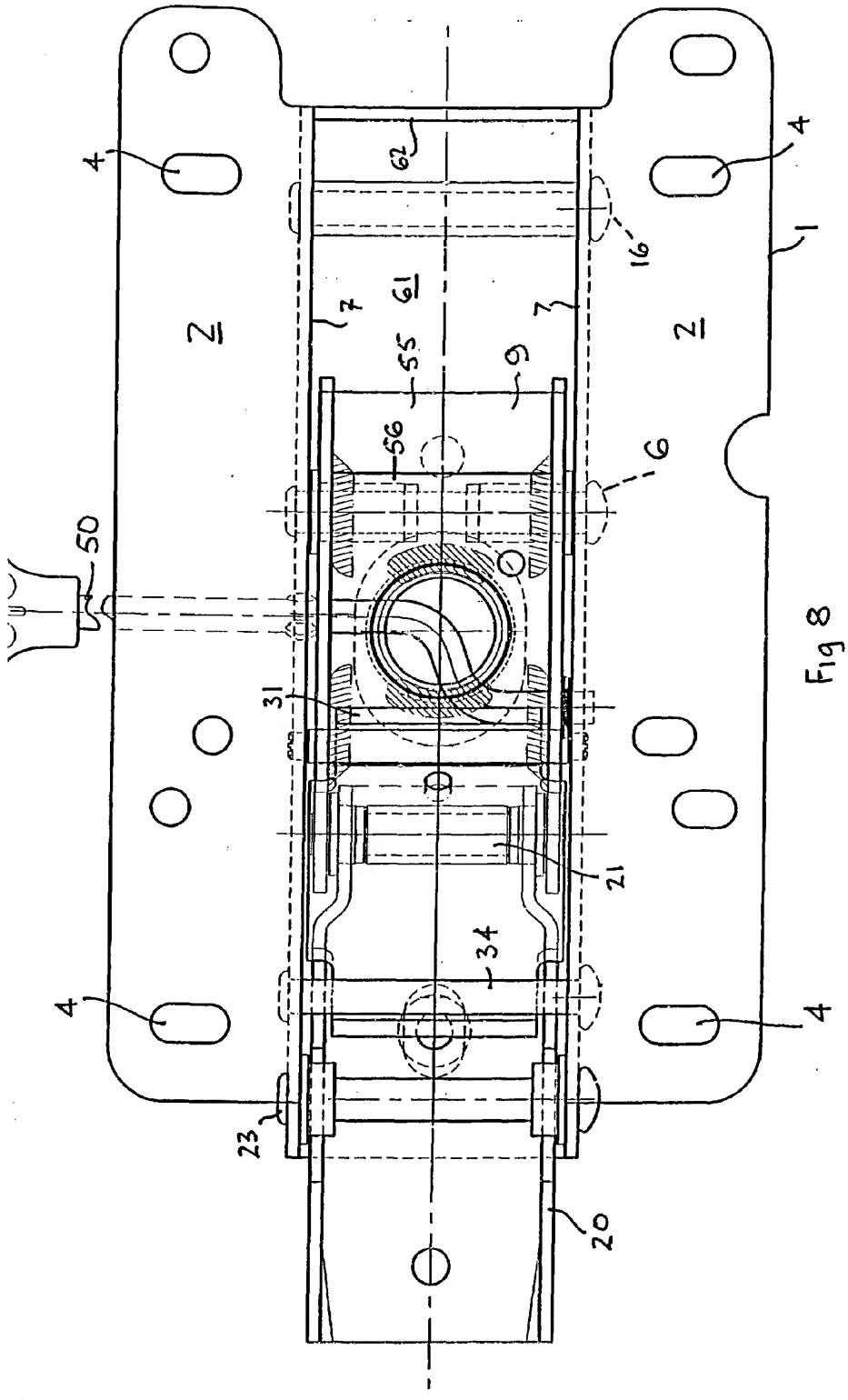


Fig 8